

Appl. No. 09/674,648
Amdt. dated , 2006
Reply to Office action of October 12, 2006

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REMARKS/ARGUMENTS

Claims 1-5, 8, 11, 12, and 14-18 are pending.

Claims 8, 11, 12 and 14-18 are canceled. Applicants reserve the right to file these canceled claims, without prejudice, in the form of a divisional application at a later date.

Claim 1 has been amended to include the limitations of claim 2, and accordingly, claim 2 canceled.

The rejection of claims 1 – 5 under 35 U.S.C. § 102(b) as being anticipated by Jordan U.S. Patent 4,382,390 is respectively traversed because Jordan does not disclose several elements of Applicants' claim 1. To anticipate a claim, the reference must teach every element of the claim. Applicants' claim 1, recites, *inter alia*, a method comprising the step of applying axial forces to the ends of the tube. Jordan fails to teach this requirement. Instead, Jordan discloses a rubber rod which is compressed from opposite sides (see column 2, lines 21- 26). According to Applicants' invention, the process requires the application of axial forces to the ends of the tube. The expansion of the shaft in the forming process causes the shaft to shorten considerably. At the same time, the bulging out parts of the shaft thin out. Within the cams the surface increases. Since there is only limited material available, the material distributes over the total area, with less material at the cam sites. The thinning out weakens the shaft at the cam locations. In order to compensate this thinning out process the shaft is pressurized from its ends in order to enhance the compression and to deliver supplement material into the cam regions. The application of axial forces to the shaft ends is essential for obtaining working cam shafts. Jordan is silent on this feature, which may be less important with the rubber expansion than with the hydraulic expansion. At least, Jordan shows an insufficient expansion of the tube in fig. 2, where he shows an open space between tube wall and cam ring.

Moreover, Applicants' amended claim 1 recites, *inter alia*, upsetting regions that lie at the ends of the tube outside the regions in which the cams are seated so

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as to be increased in thickness for forming different functional elements. Jordan, however, fails to disclose this requirement. In this respect, please attend to present figure 4 showing the treated areas 6 and 8 at the end shafts. Selecting a material for the shaft that is suitable for the internal high pressure forming method also allows to knead and upset the shafts at the and positions to obtain a desired design, which in conventional cam shafts requires different methods. Accordingly, because of the aforementioned, the rejection of claims 1-5 over Jordan should be withdrawn.

The rejection of claims 1 to 5 under 35 U.S.C. § 103(a) as being unpatentable over Suzuki (US '269) in view of Jordan and/or Dawson (WO '643) is respectively traversed. Neither Jordan, Suzuki, nor Dawson disclose a method where the tube or shaft is pressurized from its ends in order to not only make it fluid tight and counter the liquid pressure but also to provide additional compression and material flow from the ends of the tube to the cam sites. In addition, none of these references give any indication of an upsetting treatment of the end regions of the tube to increase its thickness for forming different functional elements.

As has been discussed previously, Suzuki discloses a cam shaft having cam rings attached thereto. As can be deducted from figures 1 and 11 and col. 3, l. 22 to 31 of the description, the cams are formed from oval shaped cam rings having an increased thickness in the cam position, and not from the shaft. Though being subject to an expansion process, the shaft shows bulged out regions only between cam rings and depressed regions at the cam ring locations. Suzuki does not disclose the feature of applying axial forces to the ends of the tube in order to compensate for the hydraulic pressure applied to the tube, see col. 4, lines 6 to 12, but only for compensation of the hydraulic pressure.

Dawson (WO '641) discloses a method for the manufacture of a cam shaft and a cam shaft obtained therefrom, where a tube forming the shaft is expanded together with cam rings located thereon. The cam rings are not preshaped and thus undergo the expansion together with the tube up to the limits given by the die. This requires the material of the cam rings to be equally soft than that of the tube, and the subsequent hardening of the cams to provide them with the necessary wear resistance.

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Moreover, the skilled one has no reason to combine the method of Jordan, which is specifically directed at the use of a rubber rod, with the teachings of Suzuki or Dawson. The more or less general disclosure of the application of hydraulic pressure, without further details would not motivate the skilled one to apply the teaching of Jordan on Suzuki or Dawson. In addition, Jordan highly favors the rubber forming process over the hydraulic process because of the special sealing the hydraulic process requires, see col. 3, l. 9 to 15. According to Jordan, the tube shaping is carried out by means of a rubber rod. The use of rubber for the expanding process has a severe disadvantage, if long pieces of rubber are used, namely the insufficient pressure transmission to the center of the shaft. On the other hand, if small pieces of rubber are used and pressurized from the ends within the shaft, the expanding process has to be repeated at each and every cam site. Thus, a skilled artisan would not combine the teachings of Jordan with Suzuki or Dawson.

A Notice of Allowance is respectfully solicited.

A Petition for Extension of time is also enclosed.

The Commissioner is hereby authorized to charge payment of any fees required associated with this communication or credit any overpayment to Deposit Account No. 50-3881. If an extension of time is required, please consider this a petition therefore and charge any additional fees which may be required to Deposit Account No. 50-3881. A duplicate copy of this paper is enclosed.

Respectfully submitted,



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